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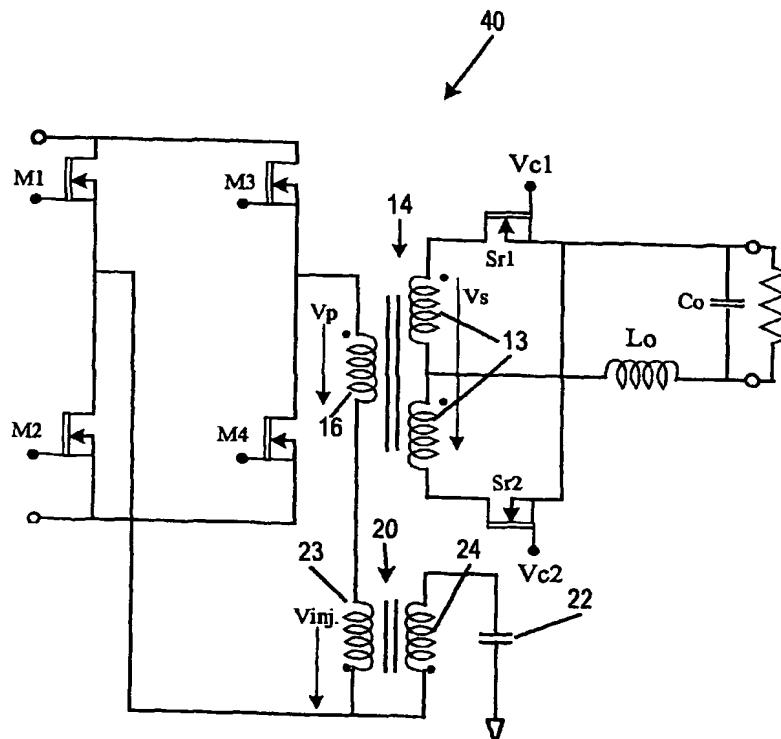
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(54) Title: SOFT SWITCHING CONVERTER USING CURRENT SHAPING



(57) Abstract: A converter (40) topology that eliminates reverse recovery losses in its output rectifying semiconductor devices (Sr1, Sr2) employs an AC injection voltage source (Vinj.) in series with a power transformer primary winding (16). Input semiconductor switches (M1, M4) in the converter's primary circuit are controlled to provide in the power transformer secondary a voltage across the winding or windings in a first direction forward biasing one of the output rectifying devices followed by a lower level reverse biasing voltage produced by the injection voltage. This lower level voltage across the secondary turns off the previously conducting rectifier device and drives carriers out of its semiconductor junction or junctions to eliminate reverse recovery losses occurring when the secondary applies a higher level reverse bias across the non-conducting rectifier device. The injection voltage source can be a transformer (20) in addition to the power transformer having a primary winding (23) in series with the primary winding of the power transformer and a secondary winding (24) connected to ground through a capacitor (22). In addition to preventing reverse recovery losses in the rectifying devices in the secondary, the injection voltage transformer also injects an AC triangular waveform current (Vinj.) into the current in the converter primary input circuit to the junction of the semiconductor switches where they are connected in a bridge circuit supplying the power transformer primary. By this, the injection voltage source assures zero voltage switching of the semiconductor switches even at light loads.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H02M3/337 H02M3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
 IPC 7 H02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category ^o	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE DONCKER R W ET AL: "A three-phase soft-switched high power density DC/DC converter for high power applications" 1988 IEEE, 2 October 1988 (1988-10-02), pages 796-805, XP010519176 page 1; figure 1	1-4
X	EP 0 430 242 A (SYSTEL DEV & IND LTD) 5 June 1991 (1991-06-05) abstract column 3, line 30 - line 58 figure 2	5,7,8, 10-12, 14,16, 26-28, 33-35

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	US 2002/122318 A1 (GUERRERA NUNZIO) 5 September 2002 (2002-09-05) abstract column 2, line 23 - line 60 figure 4 -----	1, 5, 26, 32

INTERNATIONAL SEARCH REPORT

Information on patent family members

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		DE 69030994 D1		07-08-1997
		DE 69030994 T2		12-02-1998
		EP 0430242 A2		05-06-1991
		US 5227941 A		13-07-1993
US 2002122318	A1 05-09-2002	NONE		